

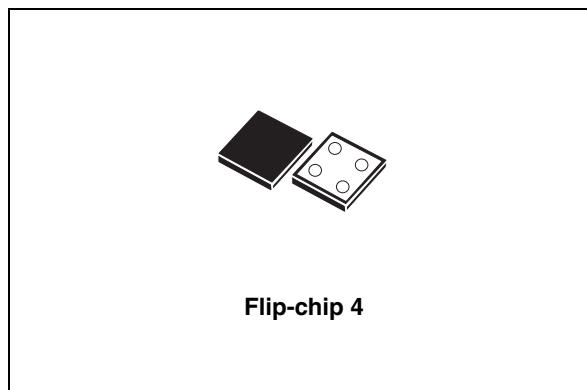


## LD39015Jxx

150 mA low quiescent current  
low noise voltage regulator

### Features

- Input voltage from 1.5 to 5.5 V
- Ultra low dropout voltage (90 mV typ. at 100 mA load)
- Very low quiescent current (20  $\mu$ A typ. at no load, 35  $\mu$ A typ. at 150 mA load, 1  $\mu$ A max in off mode)
- Low noise (54  $\mu$ V<sub>RMS</sub> from 10 Hz to 100 kHz at V<sub>OUT</sub> = 1.8 V)
- Output voltage tolerance:  $\pm 2.0\%$  @ 25 °C
- 150 mA guaranteed output current
- Wide range of output voltages available on request: 0.8 V to 4.5 V with 100 mV step
- Logic-controlled electronic shutdown
- Compatible with ceramic capacitor C<sub>OUT</sub> = 1  $\mu$ F
- Internal current and thermal limit
- Flip-chip 4 bumps 1.1 x 1.1 mm.
- Temperature range: -40 °C to 125 °C



74 dB at low frequencies and starts to roll off at 10 kHz. Enable logic control function puts the LD39015Jxx in shut-down mode allowing a total current consumption lower than 1  $\mu$ A. The device also includes a short-circuit constant current limiting and thermal protection. Typical applications are mobile phones, personal digital assistant (PDAs), cordless phone and similar battery powered systems.

### Description

The LD39015Jxx provides 150 mA maximum current from an input voltage ranging from 1.5 V to 5.5 V with a typical dropout voltage of 80 mV. It is stable with ceramic capacitor. The ultra low drop-voltage, low quiescent current and low noise features make it suitable for low power battery powered applications. Power supply rejection is

**Table 1. Device summary**

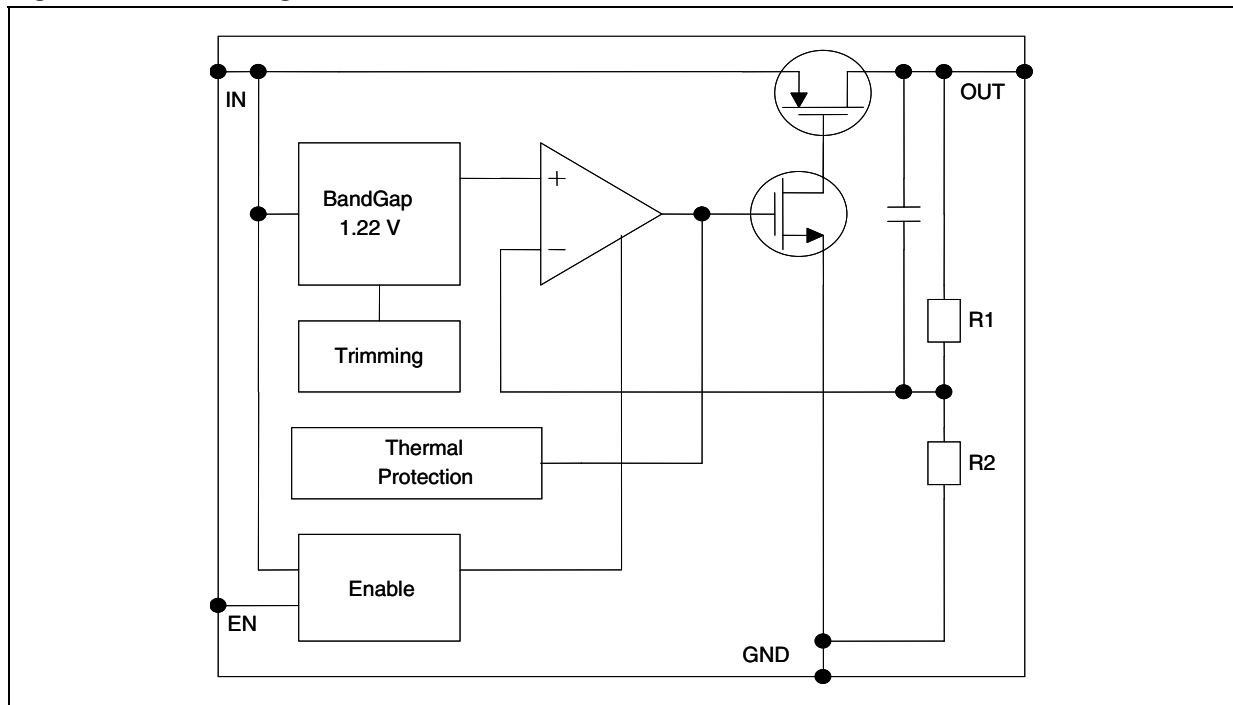
Part numbers	Order codes	Output voltages
LD39015JXX12	LD39015J12R	1.2 V
LD39015JXX13	LD39015J13R	1.3 V
LD39015JXX15	LD39015J15R	1.5 V
LD39015JXX18	LD39015J18R	1.8 V
LD39015JXX28	LD39015J28R	2.8 V

# Contents

<b>1</b>	<b>Diagram .....</b>	<b>3</b>
<b>2</b>	<b>Pin configuration .....</b>	<b>4</b>
<b>3</b>	<b>Typical application .....</b>	<b>5</b>
<b>4</b>	<b>Maximum ratings .....</b>	<b>6</b>
<b>5</b>	<b>Electrical characteristics .....</b>	<b>7</b>
<b>6</b>	<b>Typical performance characteristics .....</b>	<b>9</b>
<b>7</b>	<b>Package mechanical data .....</b>	<b>11</b>
<b>8</b>	<b>Different output voltage versions of the LD39015Jxx available on request .....</b>	<b>15</b>
<b>9</b>	<b>Revision history .....</b>	<b>16</b>

# 1 Diagram

Figure 1. Block diagram



## 2 Pin configuration

Figure 2. Pin connection (top view)

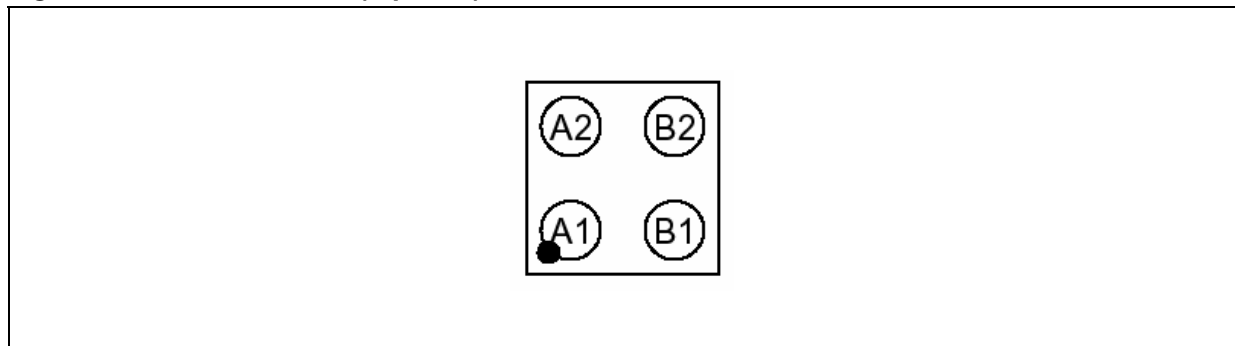
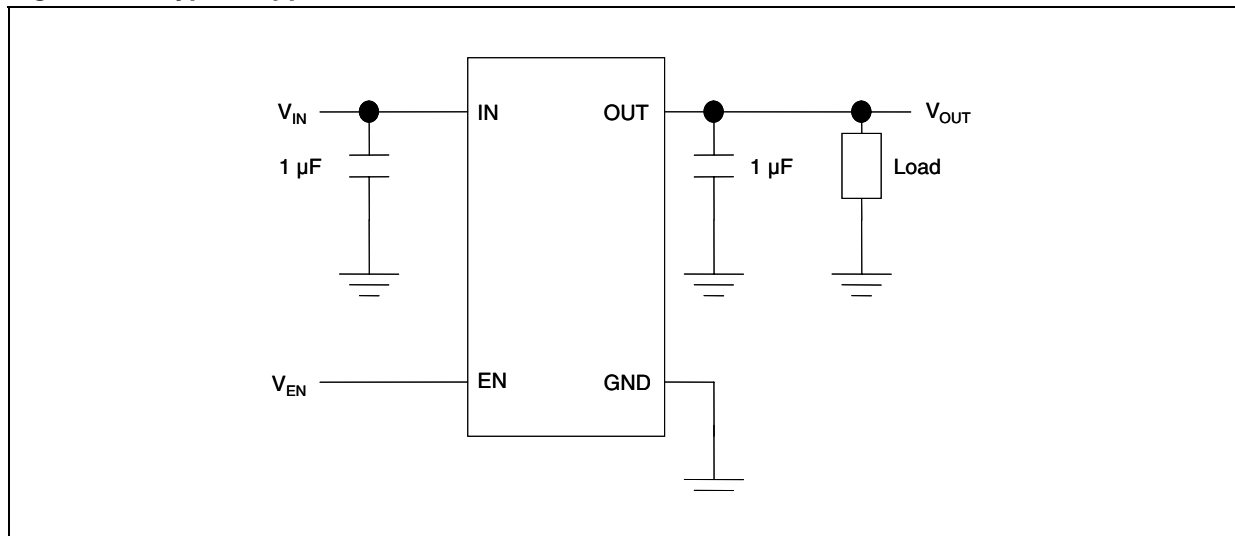


Table 2. Pin description

Pin n°	Symbol	Function
A2	EN	Enable pin logic input: Low=shutdown, High=active
A1	GND	Common ground
B2	IN	Input voltage of the LDO
B1	OUT	Output voltage

### 3 Typical application

Figure 3. Typical application circuit



## 4 Maximum ratings

**Table 3. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{IN}$	DC input voltage	- 0.3 to 6	V
$V_{OUT}$	DC output voltage	- 0.3 to $V_I + 0.3$	V
$V_{EN}$	Enable input voltage	- 0.3 to $V_I + 0.3$	V
$I_{OUT}$	Output current	Internally limited	mA
$P_D$	Power dissipation	Internally limited	mW
$T_{STG}$	Storage temperature range	-65 to 150	°C
$T_{OP}$	Operating junction temperature range	-40 to 125	°C

*Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. All values are referred to GND.*

**Table 4. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJA}$	Thermal resistance junction-ambient	180	°C/W

## 5 Electrical characteristics

$T_J = 25\text{ }^{\circ}\text{C}$ ,  $V_{IN} = V_{OUT(NOM)} + 1\text{ V}$ ,  $C_{IN} = C_{OUT} = 1\text{ }\mu\text{F}$ ,  $I_{OUT} = 1\text{ mA}$ ,  $V_{EN} = V_{IN}$ , unless otherwise specified.

**Table 5. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{IN}$	Operating input voltage		1.5		5.5	V
$V_{UVLO}$	Turn-on threshold			1.45	1.48	V
	Turn-off threshold		1.30	1.35		mV
$V_{OUT}$	$V_{OUT}$ accuracy	$V_{OUT} > 1.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$	-2.0		2.0	%
		$V_{OUT} > 1.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$ , $-40\text{ }^{\circ}\text{C} < T_J < 125\text{ }^{\circ}\text{C}$	-3.0		3.0	
		$V_{OUT} \leq 1.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$		$\pm 10$		mV
		$V_{OUT} \leq 1.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$ , $-40\text{ }^{\circ}\text{C} < T_J < 125\text{ }^{\circ}\text{C}$		$\pm 30$		
$\Delta V_{OUT}$	Static line regulation	$V_{OUT} + 1\text{ V} \leq V_{IN} \leq 5.5\text{ V}$ , $I_{OUT} = 1\text{ mA}$		0.01		%/V
$\Delta V_{OUT}$	Static load regulation	$I_{OUT} = 1\text{ mA}$ to $150\text{ mA}$		0.002		%/mA
$V_{DROP}$	Dropout voltage <sup>(1)</sup>	$I_{OUT} = 100\text{ mA}$ , $V_{OUT} > 1.5\text{ V}$ $-40\text{ }^{\circ}\text{C} < T_J < 125\text{ }^{\circ}\text{C}$		90	130	mV
$e_N$	Output noise voltage	10Hz to 100kHz, $I_{OUT} = 10\text{ mA}$ , $V_{OUT} = 1.8\text{ V}$ , $V_{IN} = 2.8\text{ V}$		54		$\mu\text{V}_{RMS}$
SVR	Supply voltage rejection $V_{OUT} = 1.5\text{ V}$	$V_{IN} = V_{OUTNOM} + 1\text{ V} \pm V_{RIPPLE}$ $V_{RIPPLE} = 0.1\text{ V}$ , freq. = 1kHz $I_{OUT} = 10\text{ mA}$		74		dB
		$V_{IN} = V_{OUTNOM} + 0.5\text{ V} \pm V_{RIPPLE}$ $V_{RIPPLE} = 0.1\text{ V}$ , Freq.=10kHz $I_{OUT} = 10\text{ mA}$		67		
$I_Q$	Quiescent current	$I_{OUT} = 0\text{ mA}$		20		$\mu\text{A}$
		$I_{OUT} = 0\text{ mA}$ , $-40\text{ }^{\circ}\text{C} < T_J < 125\text{ }^{\circ}\text{C}$			40	
		$I_{OUT} = 0$ to $150\text{ mA}$		35		
		$I_{OUT} = 0$ to $150\text{ mA}$ $-40\text{ }^{\circ}\text{C} < T_J < 125\text{ }^{\circ}\text{C}$			50	
		$V_{IN}$ input current in OFF MODE: $V_{EN} = \text{GND}$		0.003	1	
$I_{SC}$	Short circuit current	$R_L = 0$	200			mA
$V_{EN}$	Enable input logic low	$V_{IN} = 1.5\text{ V}$ to $5.5\text{ V}$ , $-40\text{ }^{\circ}\text{C} < T_J < 125\text{ }^{\circ}\text{C}$			0.4	V
	Enable input logic high	$V_{IN} = 1.5\text{ V}$ to $5.5\text{ V}$ , $-40\text{ }^{\circ}\text{C} < T_J < 125\text{ }^{\circ}\text{C}$	0.9			V
$I_{EN}$	Enable pin input current	$V_{SHDN} = V_{IN}$ , $-40\text{ }^{\circ}\text{C} < T_J < 125\text{ }^{\circ}\text{C}$		0.1	1	$\mu\text{A}$
$T_{ON}$	Turn on time <sup>(2)</sup>			30		$\mu\text{s}$

**Table 5. Electrical characteristics (continued)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$T_{\text{SHDN}}$	Thermal shutdown			160		°C
	Hysteresis			20		
$C_{\text{OUT}}$	Output capacitor	Capacitance (see typical performance characteristics for stability)	1		22	μF

1. Dropout voltage is the input-to-output voltage difference at which the output voltage is 100 mV below its nominal value. This specification does not apply for output voltages below 1.5 V.
2. Turn-on time is time measured between the enable input just exceeding  $V_{\text{EN}}$  High Value and the output voltage just reaching 95% of its nominal value.



## 6 Typical performance characteristics

Figure 4. Output voltage vs. temperature

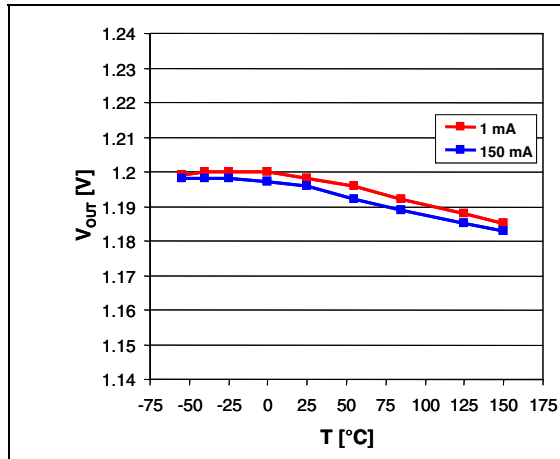


Figure 5. Output voltage vs. input voltage

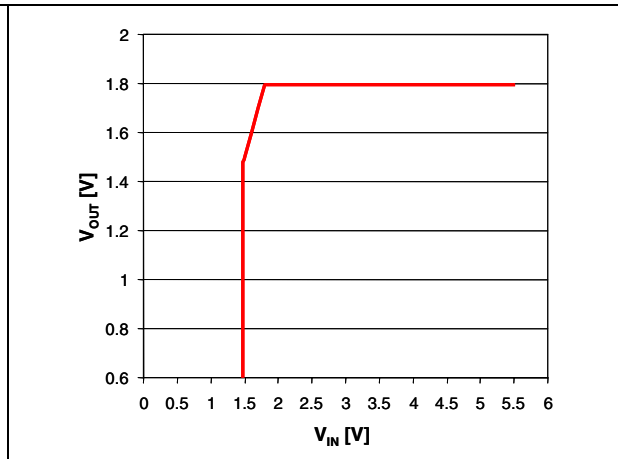


Figure 6. Dropout voltage vs. output current

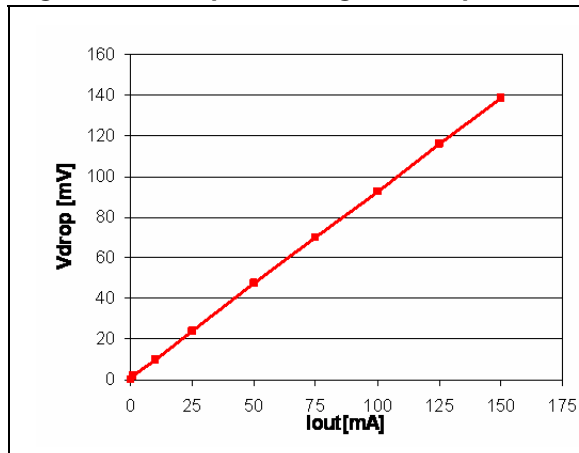
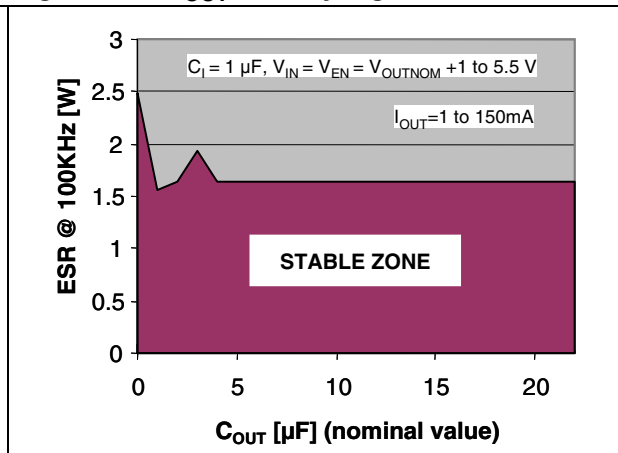
Figure 7. C<sub>OUT</sub> stability region

Figure 8. Supply voltage rejection vs. frequency

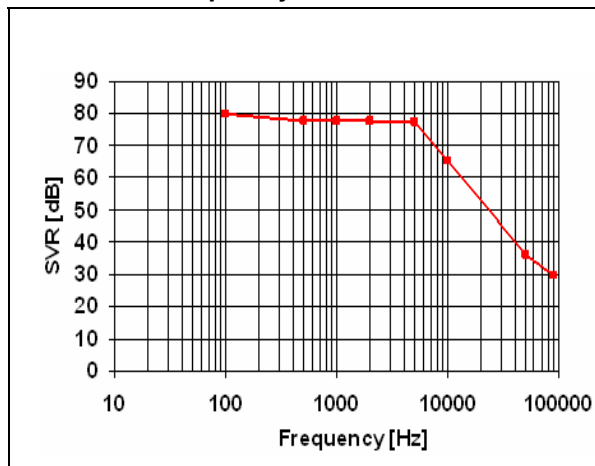


Figure 9. Output noise spectral density

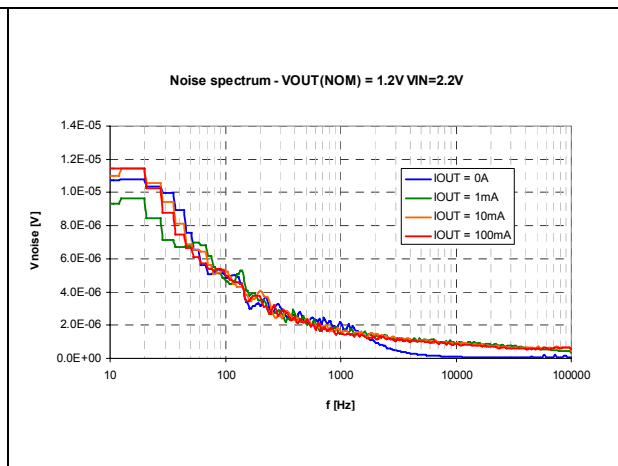


Figure 10. SVR vs. drop

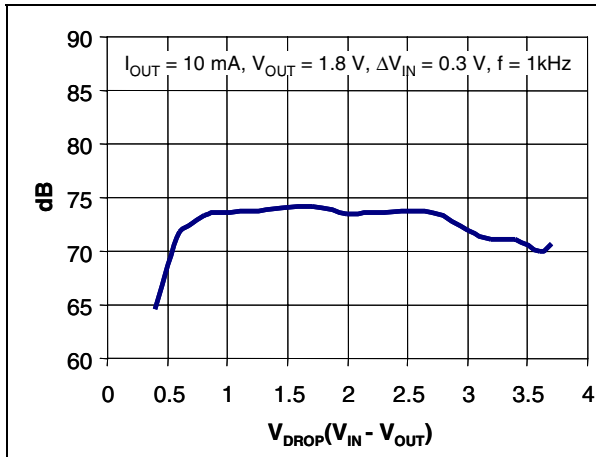
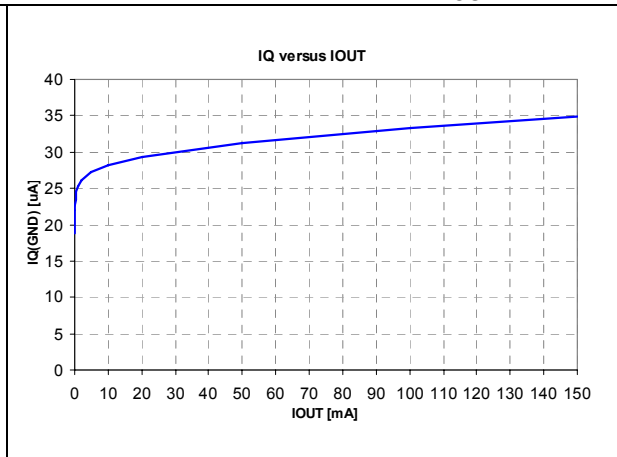
Figure 11. Quiescent current vs.  $I_{OUT}$ 

Figure 12. Quiescent current vs. input voltage

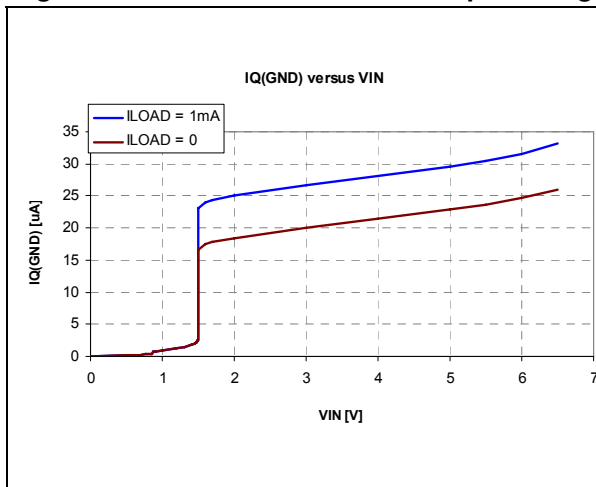


Figure 13. Load transient

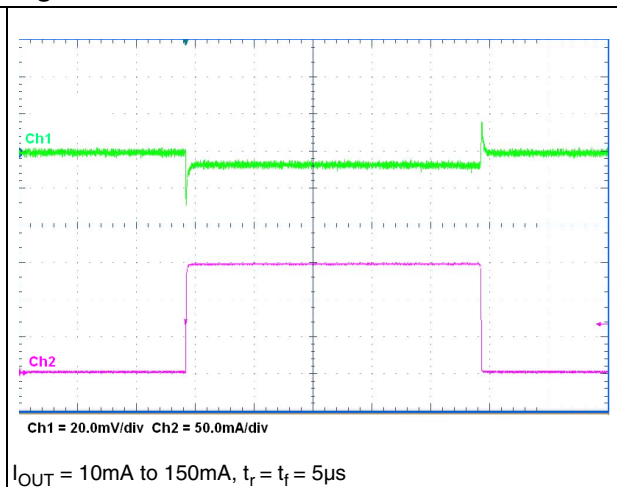


Figure 14. Line transient

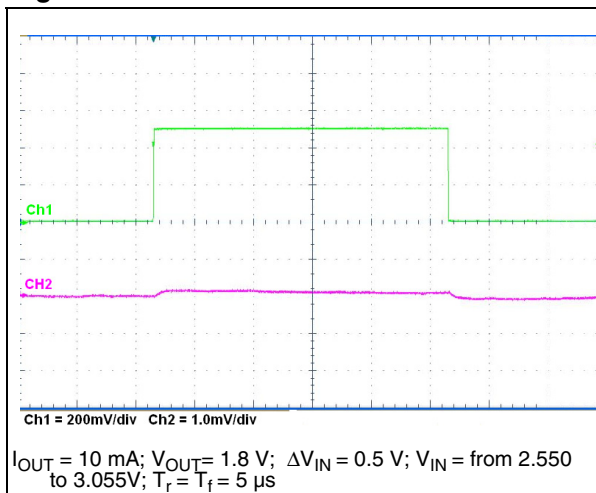
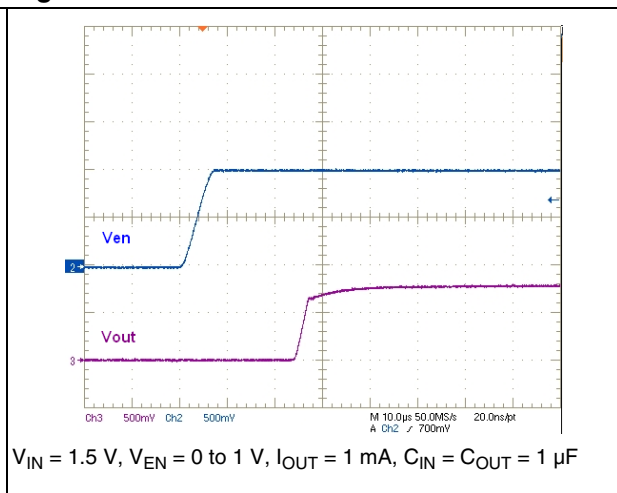


Figure 15. Enable transient

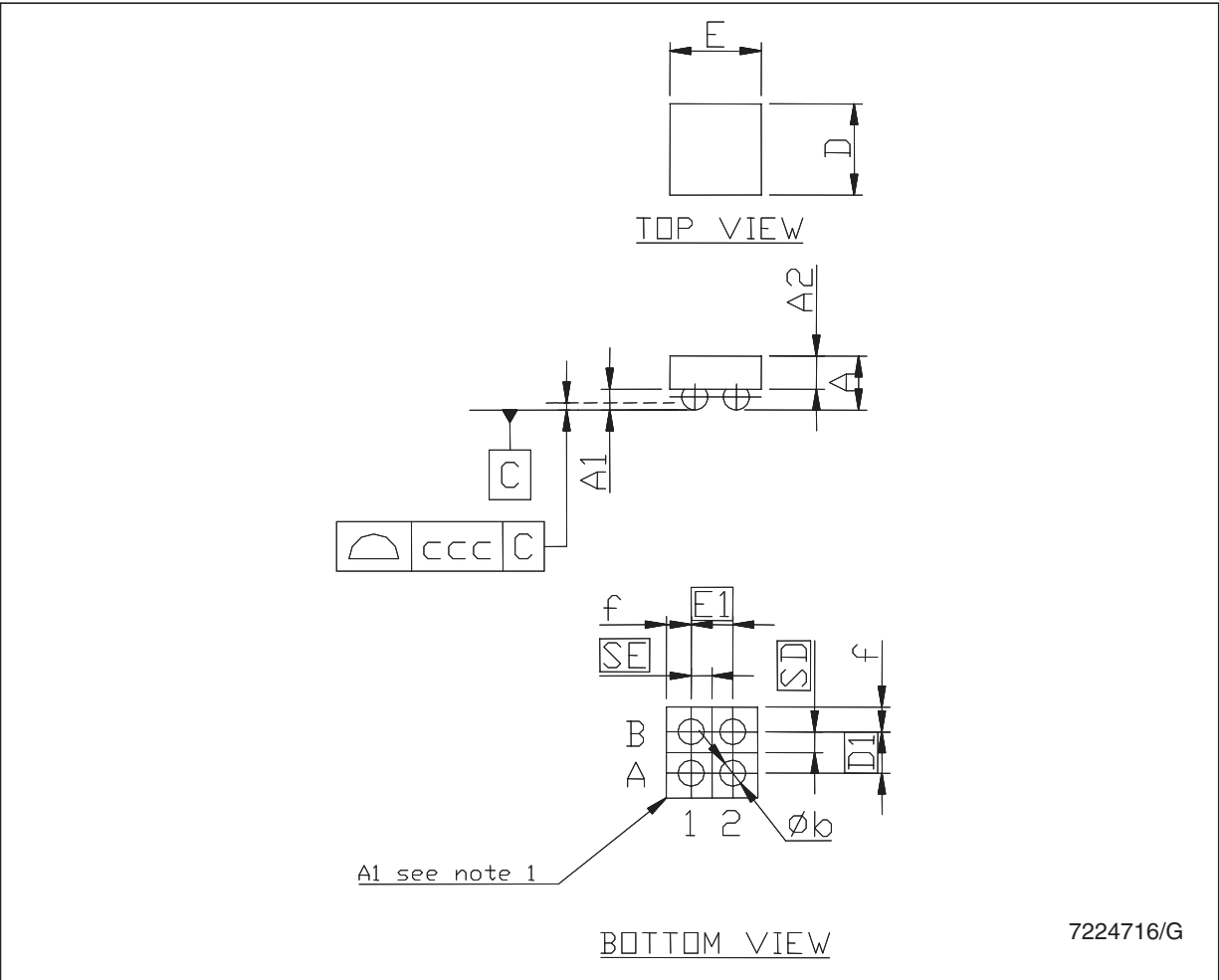


## 7 Package mechanical data

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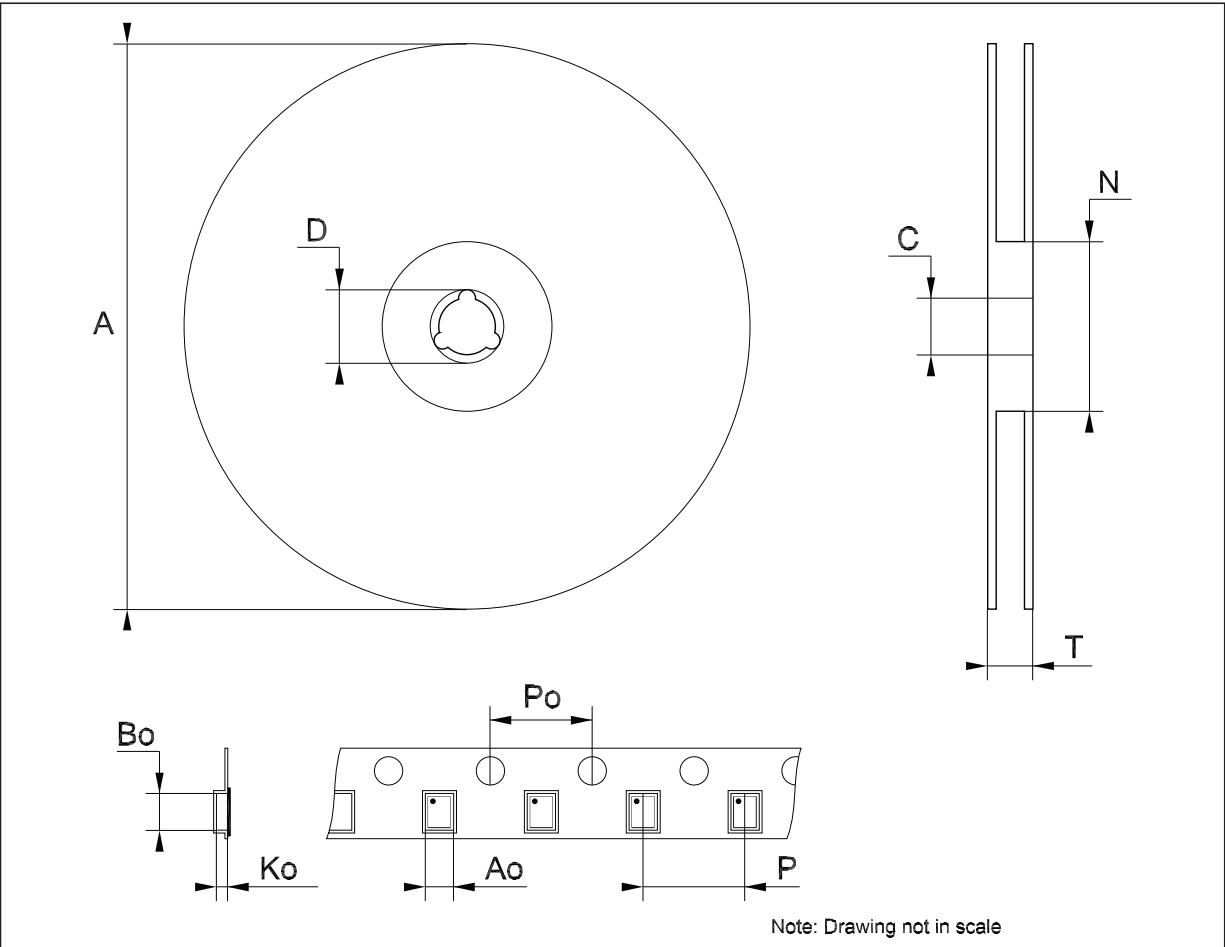
Flip-chip 4 mechanical data

Dim.	mm.			mils.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.585	0.65	0.715	23.03	25.59	28.15
A1	0.21	0.25	0.29	8.27	9.84	11.42
A2		0.40			15.75	
b	0.265	0.315	0.365	10.43	12.40	14.37
D	1.02	1.07	1.12	40.15	42.13	44.09
D1		0.5			19.69	
E	1.02	1.07	1.12	40.15	42.13	44.09
E1		0.5			19.69	
SD		0.25			9.84	
SE		0.25			9.84	



Tape and reel Flip-chip 4 mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			178			6.926
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	59	60	61	2.323	2.362	2.401
T			8.4			0.331
Ao	1.12	1.17	1.22	0.044	0.046	0.048
Bo	1.12	1.17	1.22	0.044	0.046	0.048
Ko	0.68	0.73	0.78	0.027	0.029	0.031
Po	3.9	4	4.1	0.153	0.157	0.161
P	3.9	4	4.1	0.153	0.157	0.161



0.25

0.5

0.25

A

B

1

2

0.25

Grid placement area

FOOT PRINT

## 8 Different output voltage versions of the LD39015Jxx available on request

Table 6. Options available on request

Order codes	Output voltages
LD39015J08R	0.8 V
LD39015J10R	1.0 V
LD39015J33R	3.3 V

## 9 Revision history

**Table 7. Document revision history**

Date	Revision	Changes
29-Jun-2009	1	First release.
05-Aug-2009	2	Updated tape and reel mechanical data <a href="#">on page 13</a> .



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